

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

1330909

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## (54) IMPROVED LIQUID FILTER APPARATUS

(71) We, AMERICAN AIR FILTER COMPANY, INC., a corporation of the State of Delaware, United States of America, of 215 Central Avenue, in the County of Jefferson and State of Kentucky, United States of America, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a liquid filter of the type which employs an endless filter screen wherein the endless screen is provided with an overlap expansion arrangement to permit expansion of the screen with expansion of the conveyor means. The present invention has applicability for example to an apparatus such as that disclosed in U.S. Patent No. 3,464,563.

In accordance with the present invention, an improved overlapping filter screen expansion arrangement is provided which not only permits expansion of the filter screen with expansion of the conveyor means, but further insures that the filter screen means is held in a tensioned and restrained manner as it travels along through a liquid bath, insuring that the mesh of the screen is maintained in open position for filtering purposes and at the same time insuring that the screen is effectively maintained in proper operating position along the entire length of the conveyor means in an efficient, straightforward and economical manner with a minimum of wear.

According to the invention there is provided a liquid filter assembly for removing contaminant particulates from liquid in a tank, the assembly being adapted to be located in the tank and comprising spaced opposed wall members adapted to extend longitudinally of the tank, opposed endless conveyor means mounted on each of the wall members, drive means connected to the conveyor means to drive them, a plurality of spaced screen support members mounted between the opposed conveyor means, flexible filter screen means comprising one or more flexible filter screens including leading edge, central and trailing

edge portions mounted on the spaced screen support members with the leading edge portion of the or each filter screen being fastened to a respective one of the support members, the or each central portion resting in free fashion on successive support members and the or each trailing edge portion overlapping the leading edge portion of the or the adjacent screen to permit relative sliding of the overlapping edge portions with expansion of the conveyor means, and tensioning and restraining means mounted on the conveyor means to restrain the or each central portion of the filter screen means from falling off the support members and hold the filter screen means in tension.

Embodiments of the invention will be further described by way of example and with reference to the accompanying drawings in which:

Figure 1 shows a schematic top plan view of the liquid filter assembly according to the invention incorporated in a liquid tank adapted to receive contaminant liquids to be treated;

Figure 2 shows a side elevational view of the apparatus of Figure 1;

Figure 3 shows a cross-sectional view taken in a plane passing through line 3—3 of Figure 2 disclosing the liquid filter assembly suspended in a liquid tank;

Figure 4 shows an enlarged cross-sectional view of a portion of the apparatus of Figure 3, disclosing in detail the sealing arrangement for the endless filter screen;

Figure 5 shows a cross-sectional view taken in a plane passing through line 5—5 of Figure 4;

Figure 6 shows an enlarged top plan view of a portion of the apparatus of Figures 1 and 2 disclosing the details of the overlapping filter screen arrangement including the tensioning and restraining device; and,

Figure 7 shows a cross-sectional view taken in a plane through line 7—7 of Figure 6 showing the manner in which the tensioning and restraining means engage with a U shaped bracket mounted on the filter screen.

[Price 25p]

Referring to Figure 1, 2 and 3 of the drawings, the liquid filter assembly 2 is shown disposed in liquid filter tank 3, the walls of tank 3 being contoured to include a liquid treating section 4 and a contaminant removal section 6. Contaminant removal section 6 is provided with a contaminant outlet conduit 7 to which contaminant particulates separated by endless screen filter 8 or filter assembly 2 are passed. Filter assembly 2 is suspended from tank 3 by means of suitable cross bars 9 and vertical suspension beams 11. The bars 9 are arranged to extend transversely across the open top of tank 3, and the suspension beams are each fastened at one end to the bars 9 and at the other end by means of suitable structural members 12 to one of the spaced opposed side wall members of the filter assembly 2.

Side wall members 14 of filter assembly 2 are arranged to be spaced from the side walls of tank 3 and above the bottom floor of such tank. The side walls 14 are contoured in accordance with the contour of the tank so that one portion of assembly 2 extends into the treating section 4 of the tank 3 to be below a preselected liquid level of the tank during filter treating operations, and the other portion extends into the contaminant removal section 6 of the tank with the end extremity adjacent and above contaminant outlet 7.

Provided along the inner surface of each of spaced walls 14 (Figure 4) by means of appropriately positioned and contoured right-angle structural members 16 fastened to walls 14 are endless guide channels 17. The guide channels 17 which include upper and lower flights connected by end turnaround sections serve to accommodate opposed spaced endless conveyor means 18 which are preferably in the form of chains. Each conveyor chain 18 is comprised of a series of connected link members 19, the link members in turn being provided with rollers 21 which ride in guide channels 17, (Figures 4 and 6). As can be seen in Figure 2 of the drawings, suitable sprockets 22 connected to a drive motor (not shown) can engage with the links of the spaced conveyor chains 18 to move them in endless paths in their respective guide channels 17. Each of the inner links 19 is provided with an inwardly directed bracket 23 along the inner side thereof. Referring to Figures 4 and 6 of the drawings, it can be seen that a plurality of spaced right-angle section bars 24 are arranged to transversely extend between chain 18 with the opposite ends thereof mounted on opposed brackets 23 of opposed links by suitable nut and bolt arrangements as disclosed in the advantageous embodiment of the drawings. It is to be noted that right-angle bars 24 are provided between every other pair of opposed links 19. A plurality of rods 25 are alternatively arranged with the right-angle bars 24 with

their opposite ends connected in similar fashion by suitable nut and bolt arrangements to opposed brackets 23 of alternate opposed link pairs. It is to be understood that if desired, right-angle bars 24 can be disposed between each of the successive pairs of link members to the exclusion of support bars 25 or right-angle bars can be disposed in some other preselected arrangement in alternation with the support bars 25 all in accordance with the dimension of the over-all assembly and the weight of the screens to be supported. It will be noted that each of right-angle bars 24 is provided with a leg 26 which lies in the planes of travel of the conveyor chains and an inturned leg 27 which extends normal to leg 26 (Figure 5).

The filter screen 8 in a manner similar to that as set forth in U. S. Patent No. 3,464,563 is made up of a plurality of successive flexible filter screen sections 28 which are mounted in on the spaced right-angle bars 24 and rods 25. Each of filter screen sections 28 includes a leading edge portion 29, a body portion 31, and a trailing edge portion 32, with the leading edge portion of each screen 28 being turned at right angles to fasten to an inturned leg 27 of one of the right-angle bars 24 (Figure 5) by means of a suitable fastening arrangement such as nut and bolts or rivets. The body portion 31 of each of screen sections 28 rests freely on successive legs 26 of successive bars 24 and rods 25 with the trailing edge portions of the screens being arranged to overlap with the leading edge portions 29 of immediately successive filter screen sections (Figures 5 and 6) to permit relative movement of the filter screen sections 28 with expansion of the conveyor chains 18. It is to be understood that, if the filter screen is of short length, only one flat section need be used, such section being arranged in a loop with the opposed ends thereof overlapping and the leading edge only fastened to a bar 24. It is further to be understood that the length of the sections can vary in accordance with the weight of the mesh and the overall weight and length of the filter belt needed—the particular extent of overlap of course being sufficient to accommodate the anticipated extension of the chains. As also is set forth in U.S. Patent No. 3,464,563, to restrain the body portion of filter screen sections 28 to keep the free portions 31 and 32 of the filter sections from falling off the support members as the endless conveyor chains turn around the ends of the guide channels 17 as they pass from an upper flight to a lower flight and vice versa, a plurality of spaced restraining rods 33 can be provided. These rods 33 extend transversely between side wall members 14 in coextensive fashion with right-angle bars 24 so as to be immediately above the right-angle bars in spaced relation therewith with the opposite

ends of the rods mounted on the opposed conveyor chains in similar fashion to the bars so as to restrain the free portions of the filter screens. It is to be noted that the bars 33 are provided with flat sections 34 at the opposite ends thereof, these flat sections 34 being engaged by the edges of sealing strip members 36 to minimize the amount of leakage.

As can be seen in Figures 6 and 7 of the drawings and in accordance with the present invention, in addition to restraining rods 33 or in place thereof when the screen sections 28 are short-looped spring rod members 41 are provided. Each spring rod 41 has its free ends mounted on opposed brackets 23 of links 19 of conveyor chains 18. The intermediate portion of each rod 41 extends over the trailing end of a screen section. Fastened to the trailing end 32 of each section is a longitudinally extending channel bar 42 of U shaped cross-section. Bar 42 extends transverse the screen between the conveyor chains. The intermediate portion of looped-shaped spring rod member 41 is arranged to nest in the channel of the U-shaped member to engage against one leg thereof to thus hold the free end of the screen in tension, stretching the screen taut from its fastened-down leading edge portion 29.

With such an arrangement, the meshes of the screen are insured to be maintained constantly in open state and, at the same time, the trailing edge portion of the screen is restrained on its supports during filtering operations to avoid undesirable wear. With the meshes open, the cleaning of contaminants from the filter screen is facilitated, a suitable spray conduit 39 being provided above the lower flight of the filter screen adjacent the contaminant outlet 7 in the liquid filter assembly to accomplish this.

Referring to Figures 2 and 3, it can be seen that suitable liquid outlets 37 communicate with the clean liquid plenum, clean liquid conduits 38 being provided to carry off the clean liquid for suitable use elsewhere, some being delivered to spray conduit 39.

#### WHAT WE CLAIM IS:—

1. A liquid filter assembly for removing contaminant particulates from liquid in a tank, the assembly being adapted to be located in the tank and comprising spaced opposed wall members, adapted to extend longitudinally of the tank, opposed endless conveyor means mounted on each of the wall members drive means connected to the conveyor means to drive them, a plurality of spaced screen

support members mounted between the opposed conveyor means, flexible filter screen means comprising one or more flexible filter screens including leading edge, central and trailing edge portions mounted on the spaced screen support members with the leading edge portion of the or each filter screen being fastened to a respective one of the support members, the or each central portion resting in free fashion on successive support members and the or each trailing edge portion overlapping the leading edge portion of the adjacent screen to permit relative sliding of the overlapping edge portions with expansion of the conveyor means, and tensioning and restraining means mounted on the conveyor means to restrain the or each central portion of the filter screen means from falling off the support members and hold the filter screen means in tension.

2. An assembly according to claim 1 in which the flexible filter screen means comprises a plurality of flexible filter screens each of which includes a leading edge, a body and a trailing edge portion.

3. An assembly according to either preceding claim in which the tensioning and restraining means include one or more spring rod members mounted on the conveyor means with an extending portion thereof co-operating with the or each trailing edge portion of the filter screen means to hold the same in tension.

4. An assembly according to claims 2 and 3 in which the trailing thereto with the extending portions of the spring edge portions of the filter screen means have brackets fixed/rod members in co-operative relationship with the brackets.

5. An assembly according to claim 4 in which the brackets are of U-shaped cross-section and extend transversely of the filter screen means and open outwardly from the interior of the conveyor means with the extending portions of the spring rod members nesting one in each of the brackets.

6. An assembly according to any preceding claim in which the conveyor means are each in the form of a chain.

7. A liquid filter assembly for removing contaminant particles from liquids substantially as herein described with reference to the accompanying drawings.

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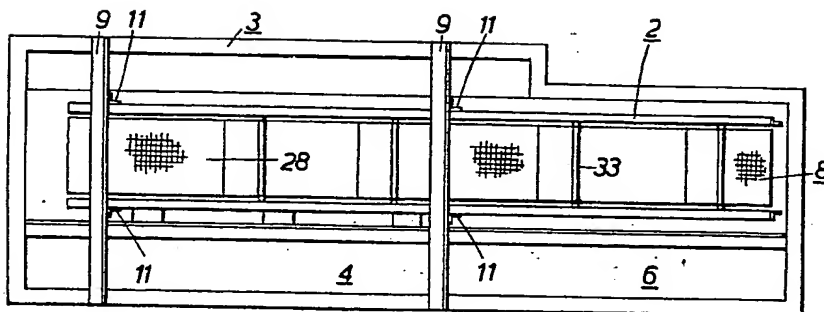


FIG. 1.

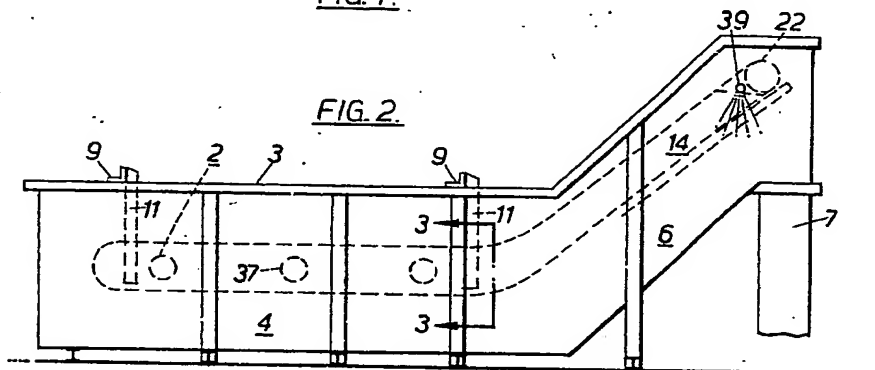


FIG. 2.

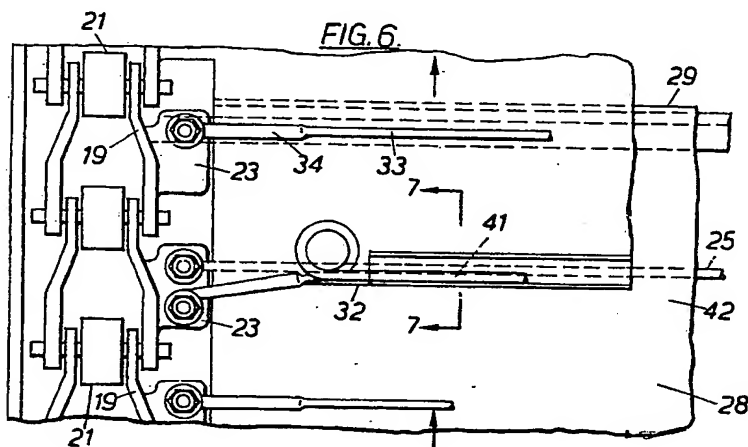


FIG. 6.

FIG. 7.

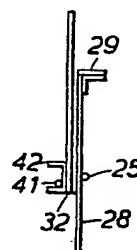
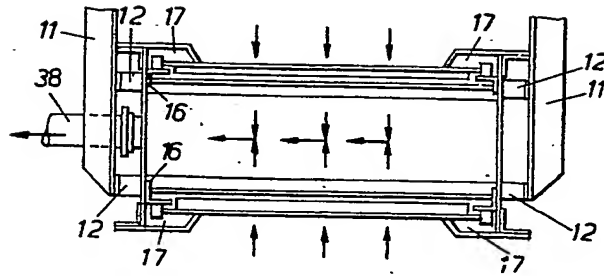
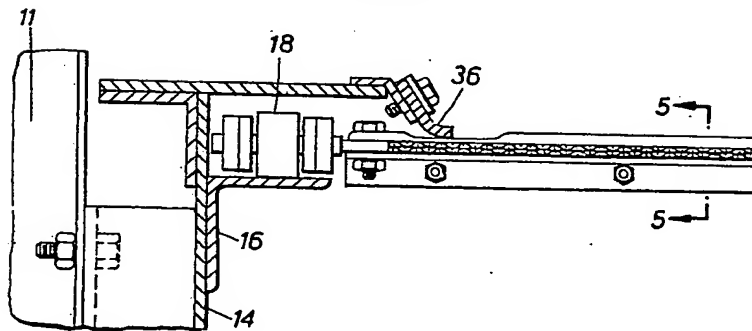


FIG. 3.FIG. 4.FIG. 5.